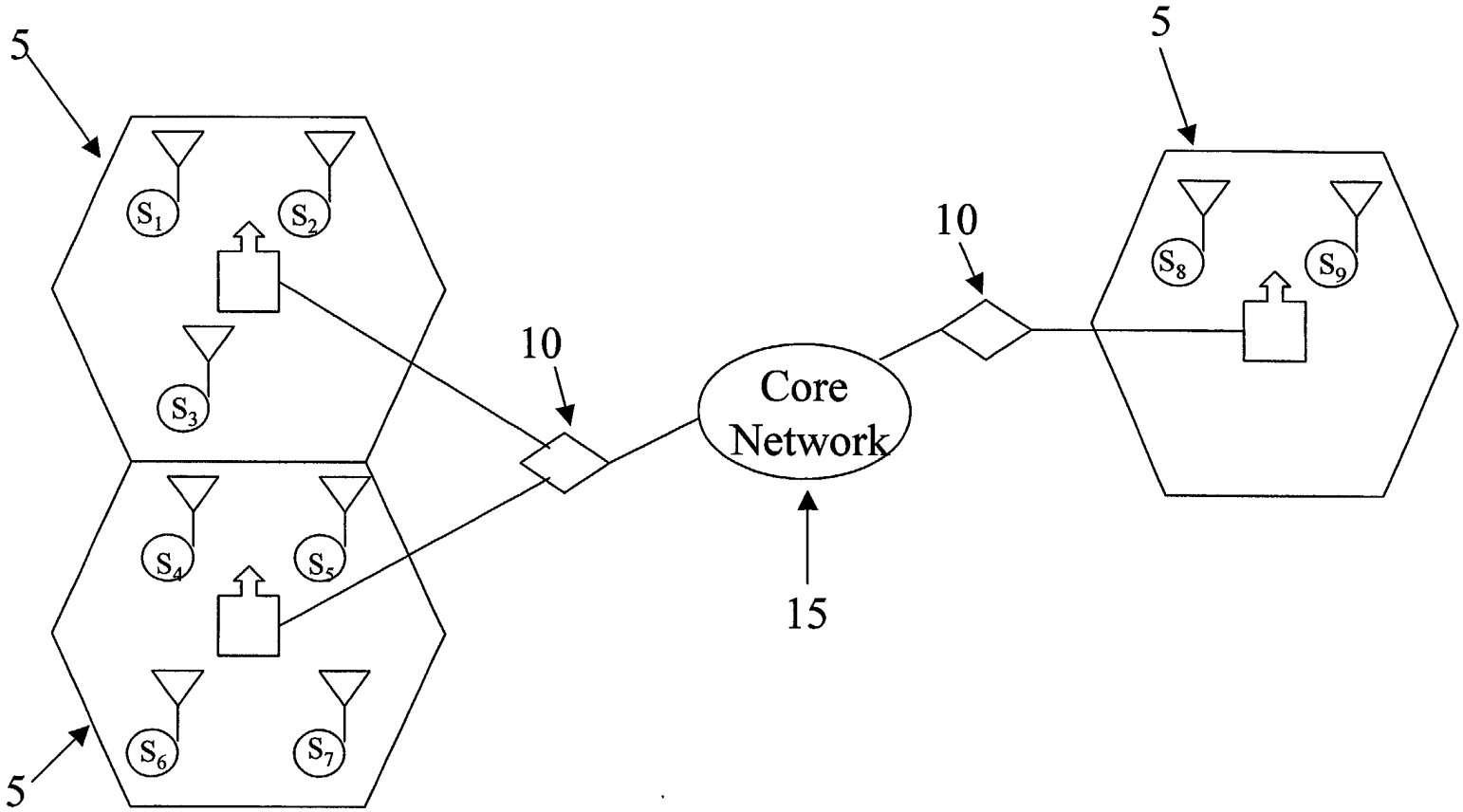

Fig. 1

TRANSMITTED 25/01/2000

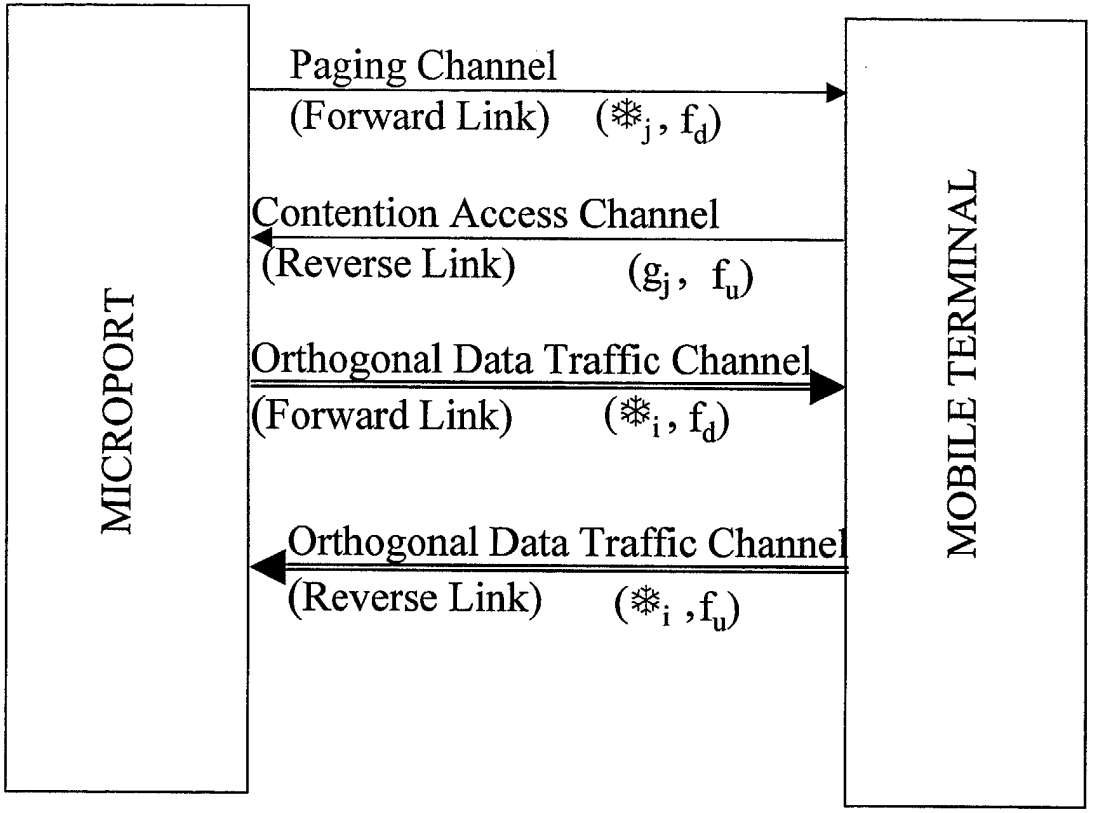

Fig. 2

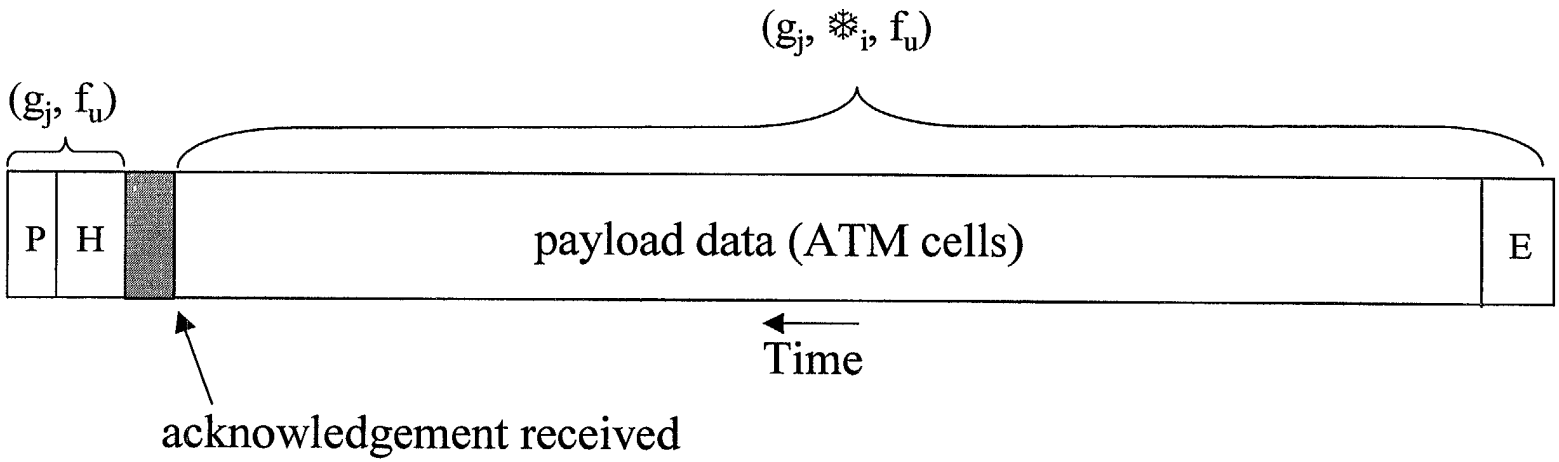
$(g_j, ❄_i, f_u)$
(g_j, f_u)
P
H
payload data (ATM cells)
E
Time
acknowledgement received

Fig. 3a

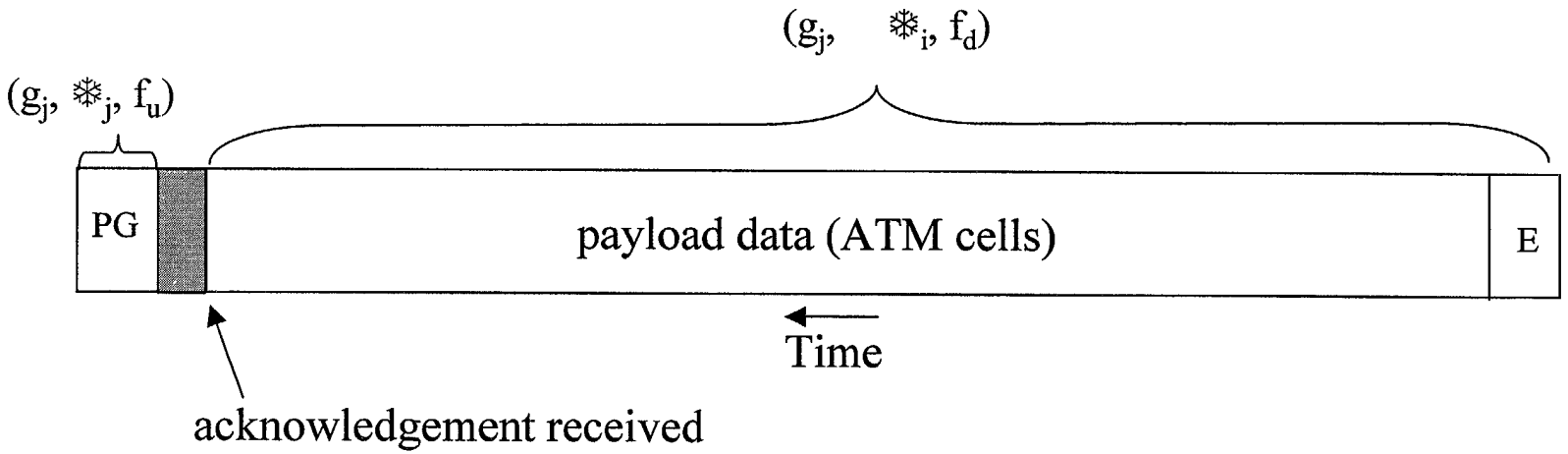
$(g_j, \ ❄_i, f_d)$
$(g_j, ❄_j, f_u)$
PG
payload data (ATM cells)
E
Time
acknowledgement received

Fig. 3b

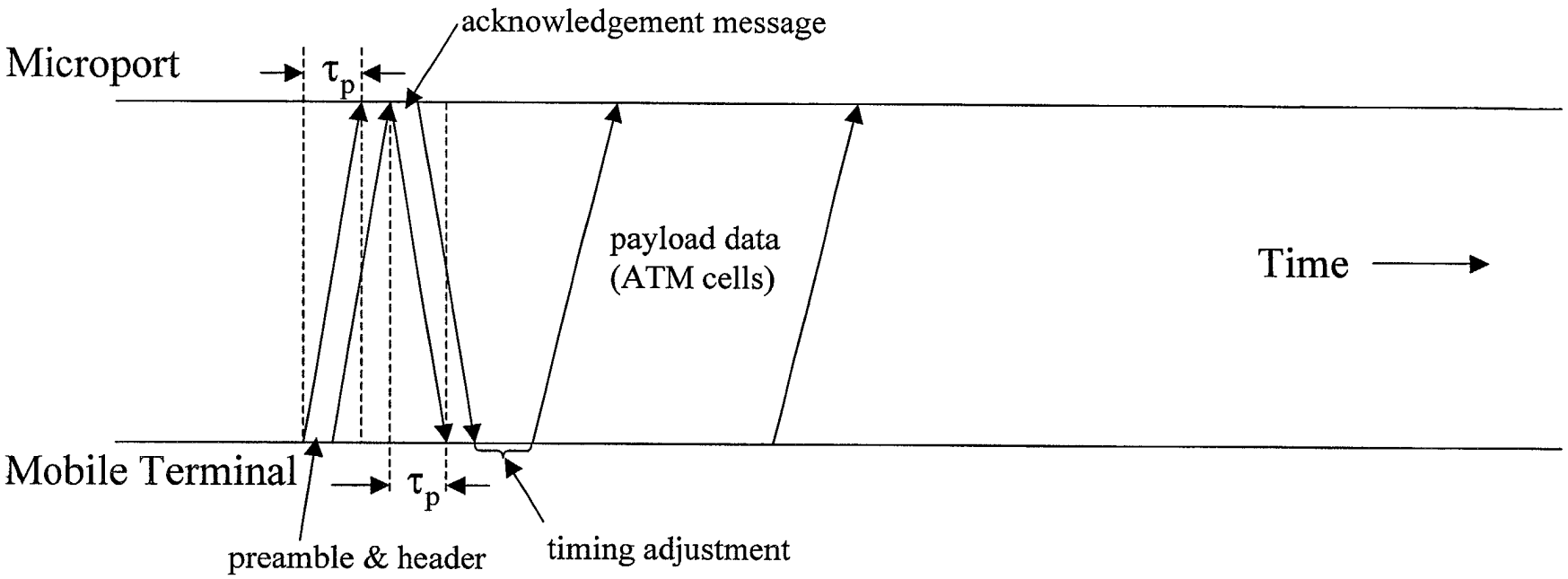
Microport
τ_p
acknowledgement message
payload data
(ATM cells)
Time
Mobile Terminal
τ_p
preamble & header
timing adjustment

Fig. 4a

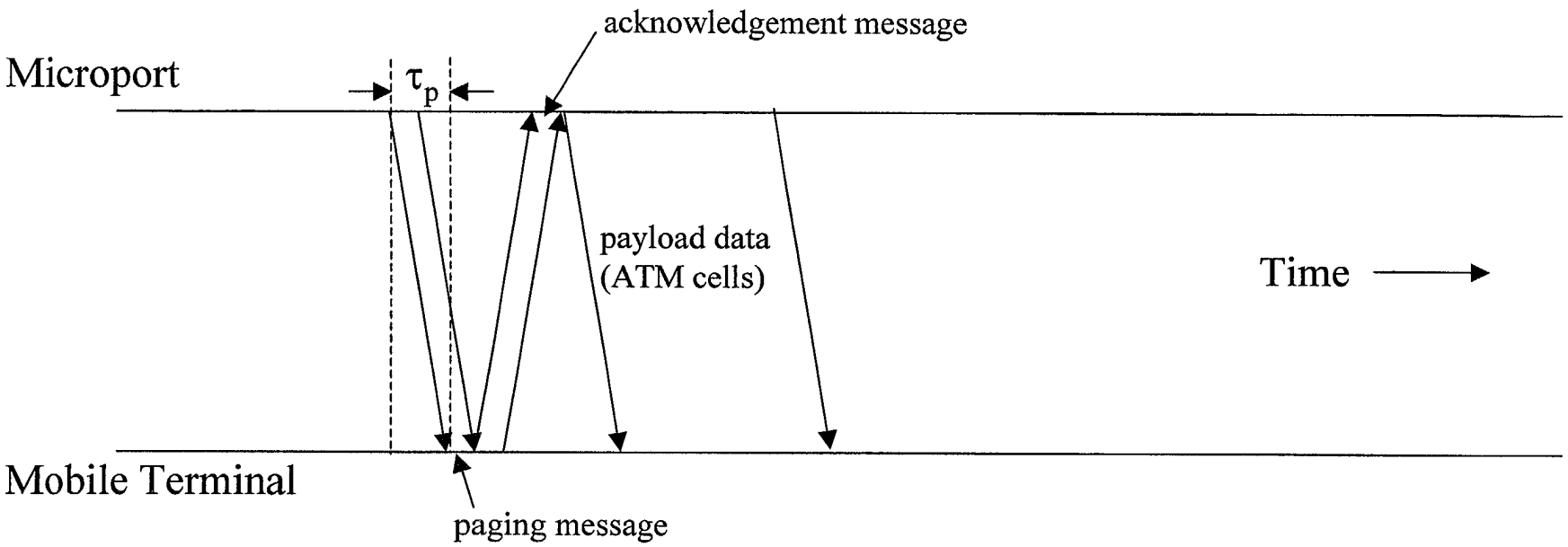
acknowledgement message
Microport
τ_p
payload data
(ATM cells)
Time
Mobile Terminal
paging message

Fig. 4b

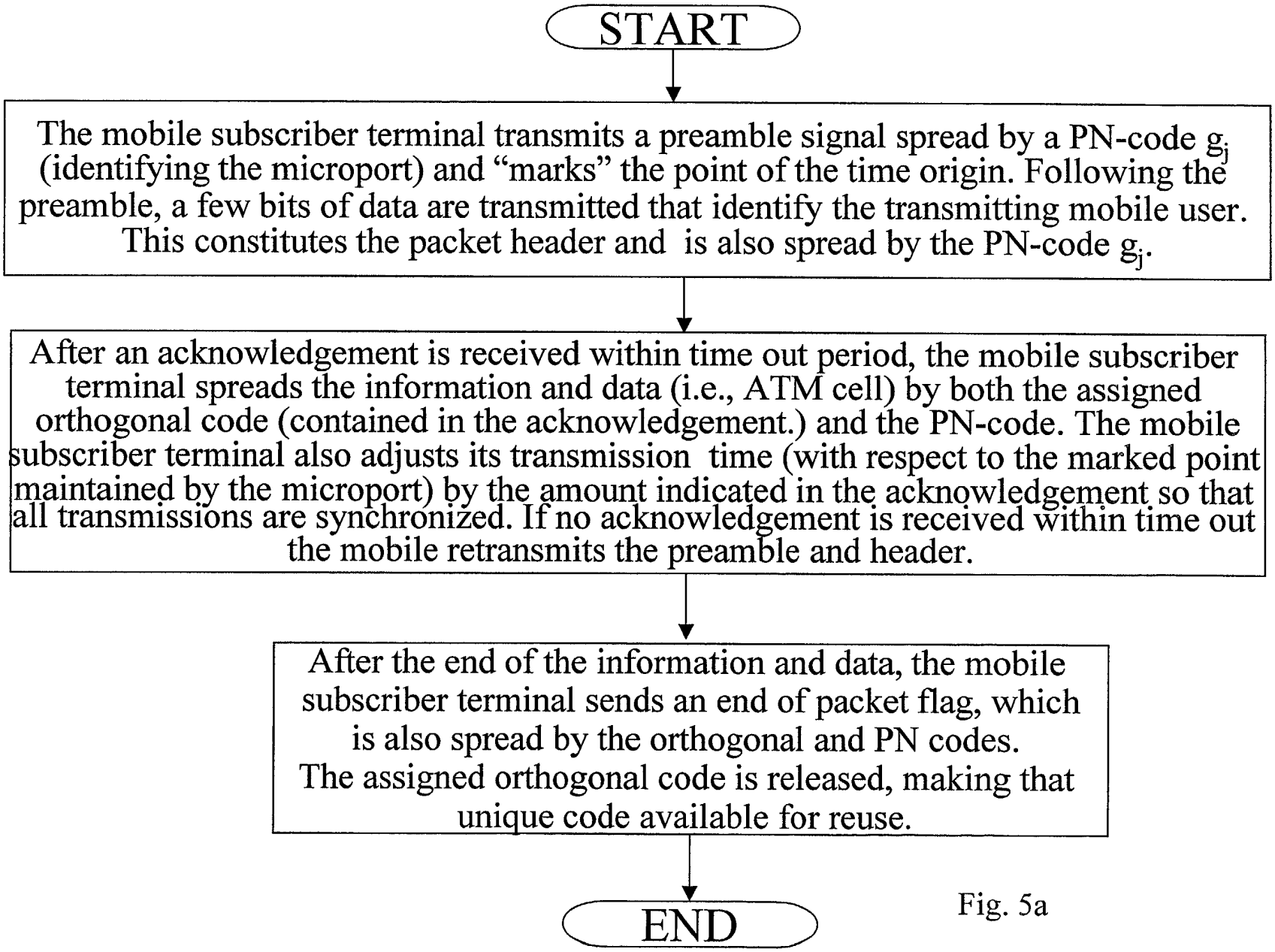
START
The mobile subscriber terminal transmits a preamble signal spread by a PN-code g_j (identifying the microport) and "marks" the point of the time origin. Following the preamble, a few bits of data are transmitted that identify the transmitting mobile user. This constitutes the packet header and is also spread by the PN-code g_j.
After an acknowledgement is received within time out period, the mobile subscriber terminal spreads the information and data (i.e., ATM cell) by both the assigned orthogonal code (contained in the acknowledgement.) and the PN-code. The mobile subscriber terminal also adjusts its transmission time (with respect to the marked point maintained by the microport) by the amount indicated in the acknowledgement so that all transmissions are synchronized. If no acknowledgement is received within time out the mobile retransmits the preamble and header.
After the end of the information and data, the mobile subscriber terminal sends an end of packet flag, which is also spread by the orthogonal and PN codes.
The assigned orthogonal code is released, making that unique code available for reuse.
END

Fig. 5a

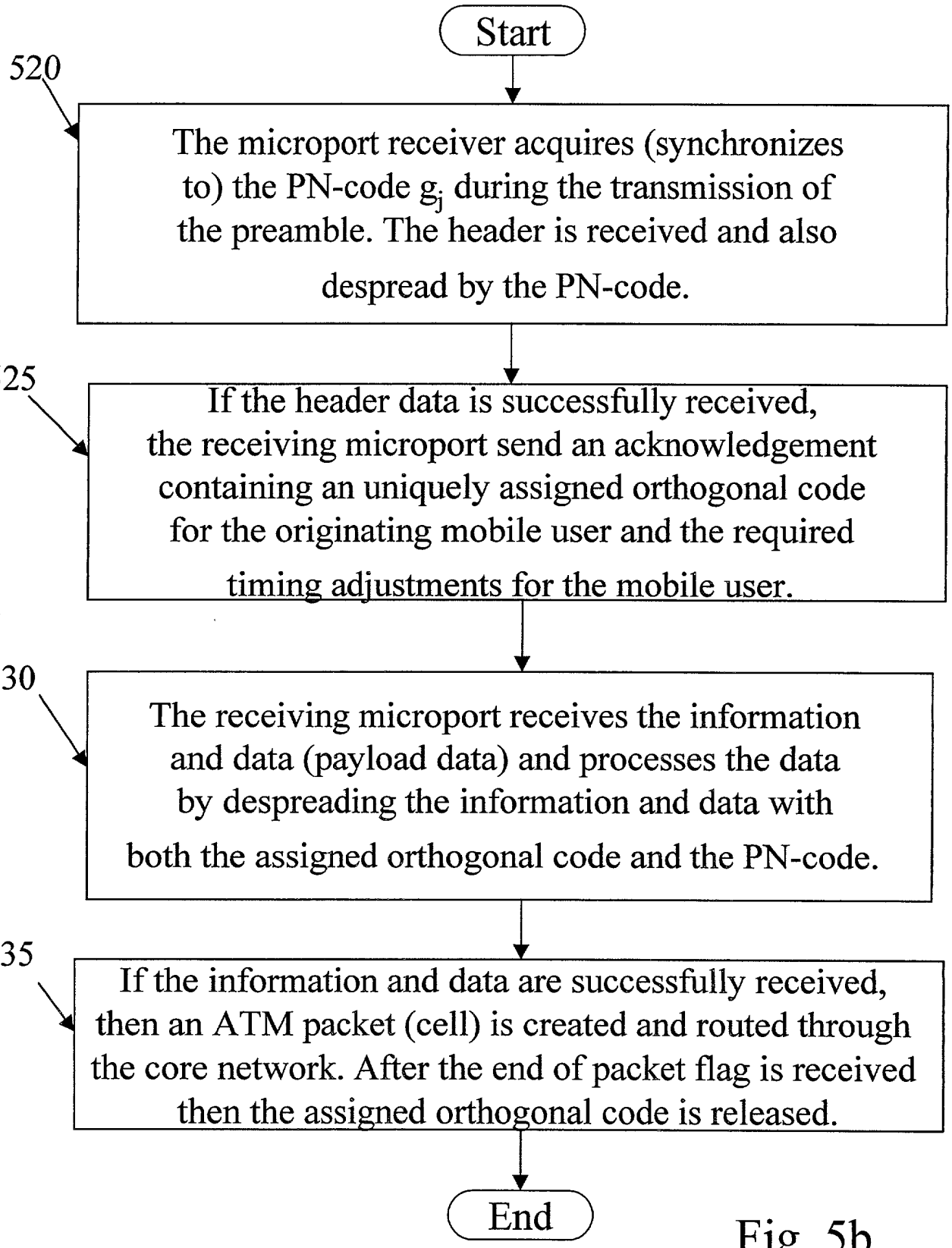
Start
520
The microport receiver acquires (synchronizes to) the PN-code g_j during the transmission of the preamble. The header is received and also despread by the PN-code.
525
If the header data is successfully received, the receiving microport send an acknowledgement containing an uniquely assigned orthogonal code for the originating mobile user and the required timing adjustments for the mobile user.
530
The receiving microport receives the information and data (payload data) and processes the data by despreading the information and data with both the assigned orthogonal code and the PN-code.
535
If the information and data are successfully received, then an ATM packet (cell) is created and routed through the core network. After the end of packet flag is received then the assigned orthogonal code is released.
End

Fig. 5b

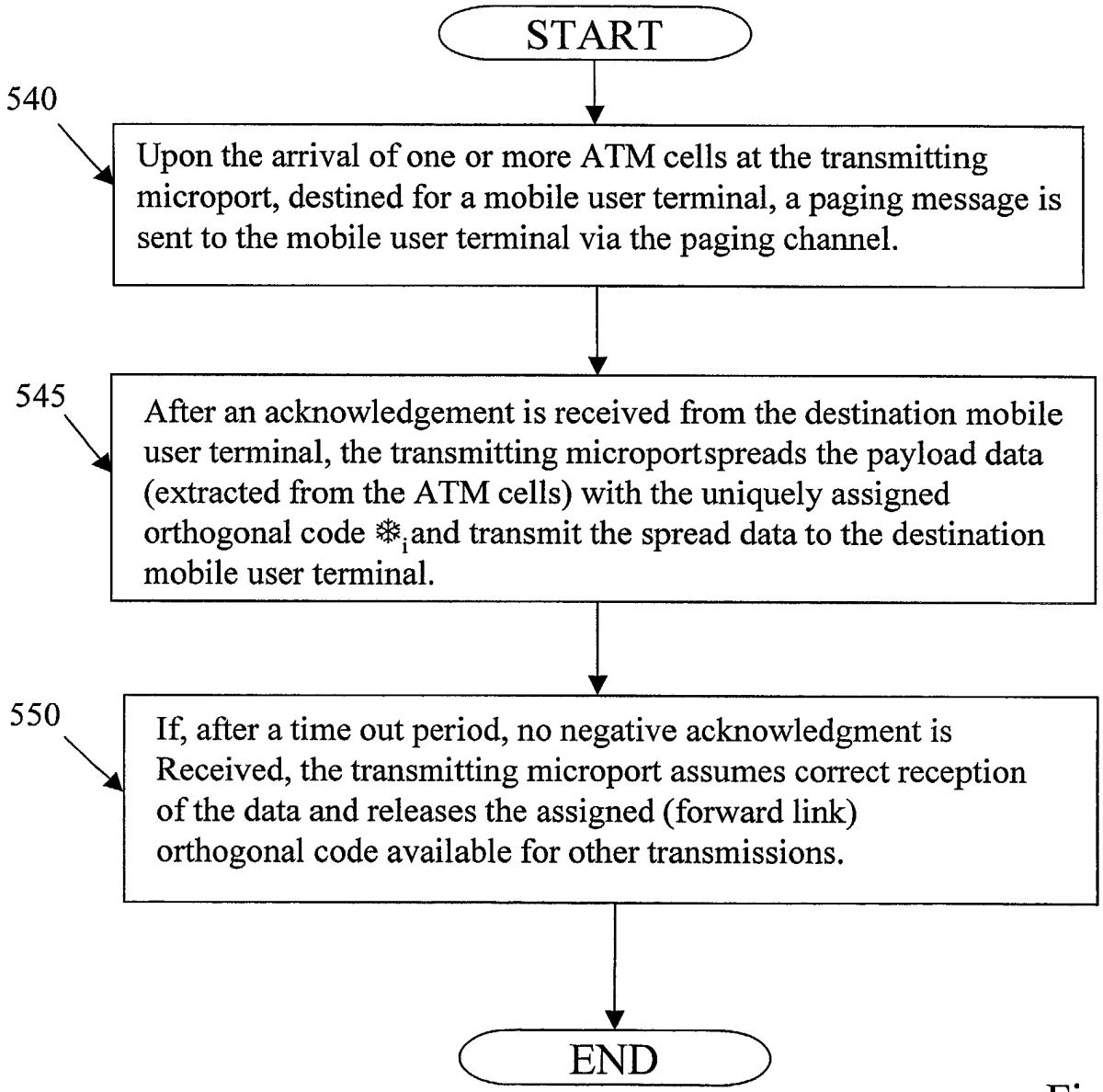
START
540
Upon the arrival of one or more ATM cells at the transmitting microport, destined for a mobile user terminal, a paging message is sent to the mobile user terminal via the paging channel.
545
After an acknowledgement is received from the destination mobile user terminal, the transmitting microportspreads the payload data (extracted from the ATM cells) with the uniquely assigned orthogonal code ❄i and transmit the spread data to the destination mobile user terminal.
550
If, after a time out period, no negative acknowledgment is Received, the transmitting microport assumes correct reception of the data and releases the assigned (forward link) orthogonal code available for other transmissions.
END

Fig. 5c

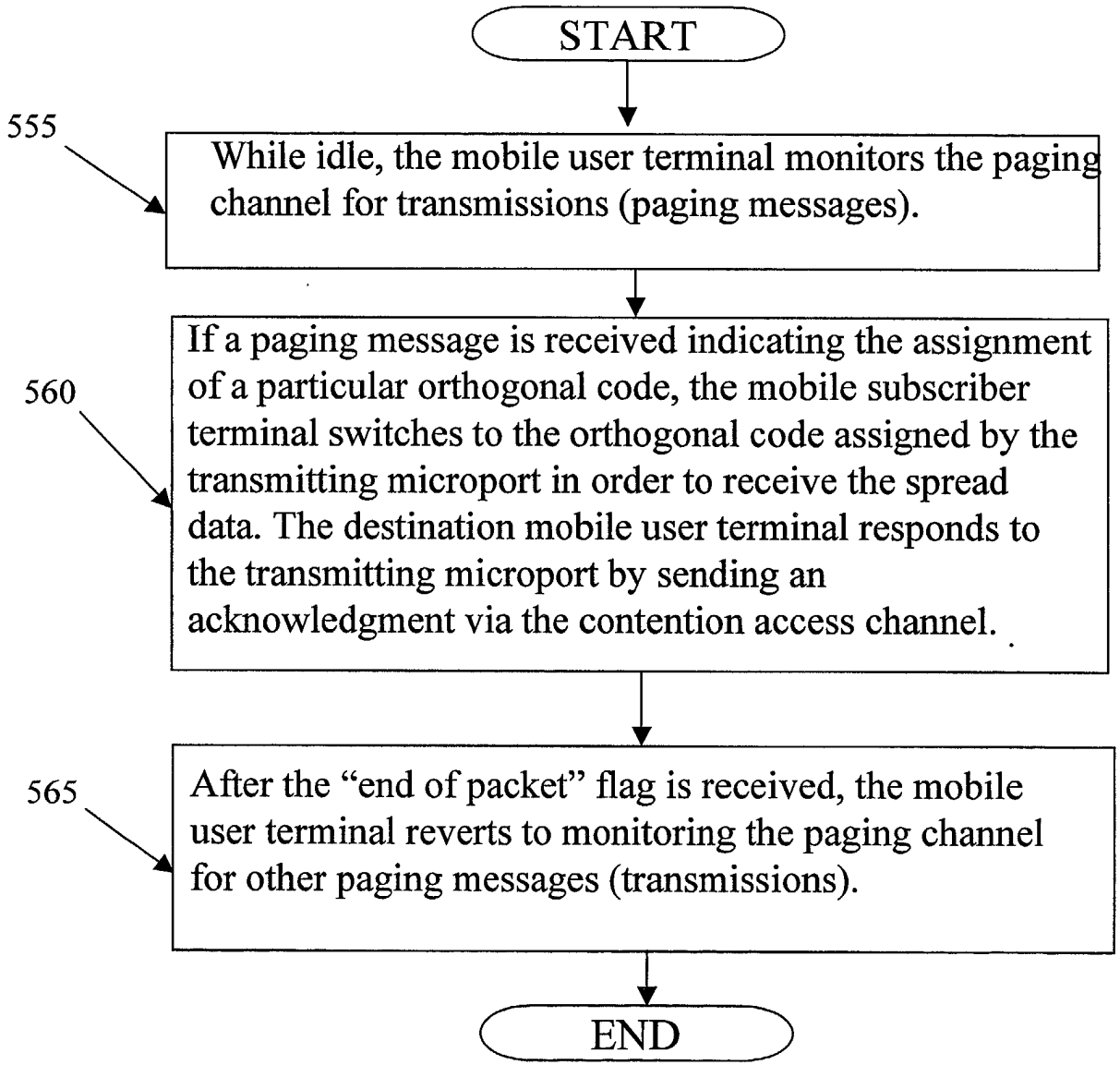
START
555
While idle, the mobile user terminal monitors the paging channel for transmissions (paging messages).
560
If a paging message is received indicating the assignment of a particular orthogonal code, the mobile subscriber terminal switches to the orthogonal code assigned by the transmitting microport in order to receive the spread data. The destination mobile user terminal responds to the transmitting microport by sending an acknowledgment via the contention access channel.
565
After the "end of packet" flag is received, the mobile user terminal reverts to monitoring the paging channel for other paging messages (transmissions).
END

Fig.5d

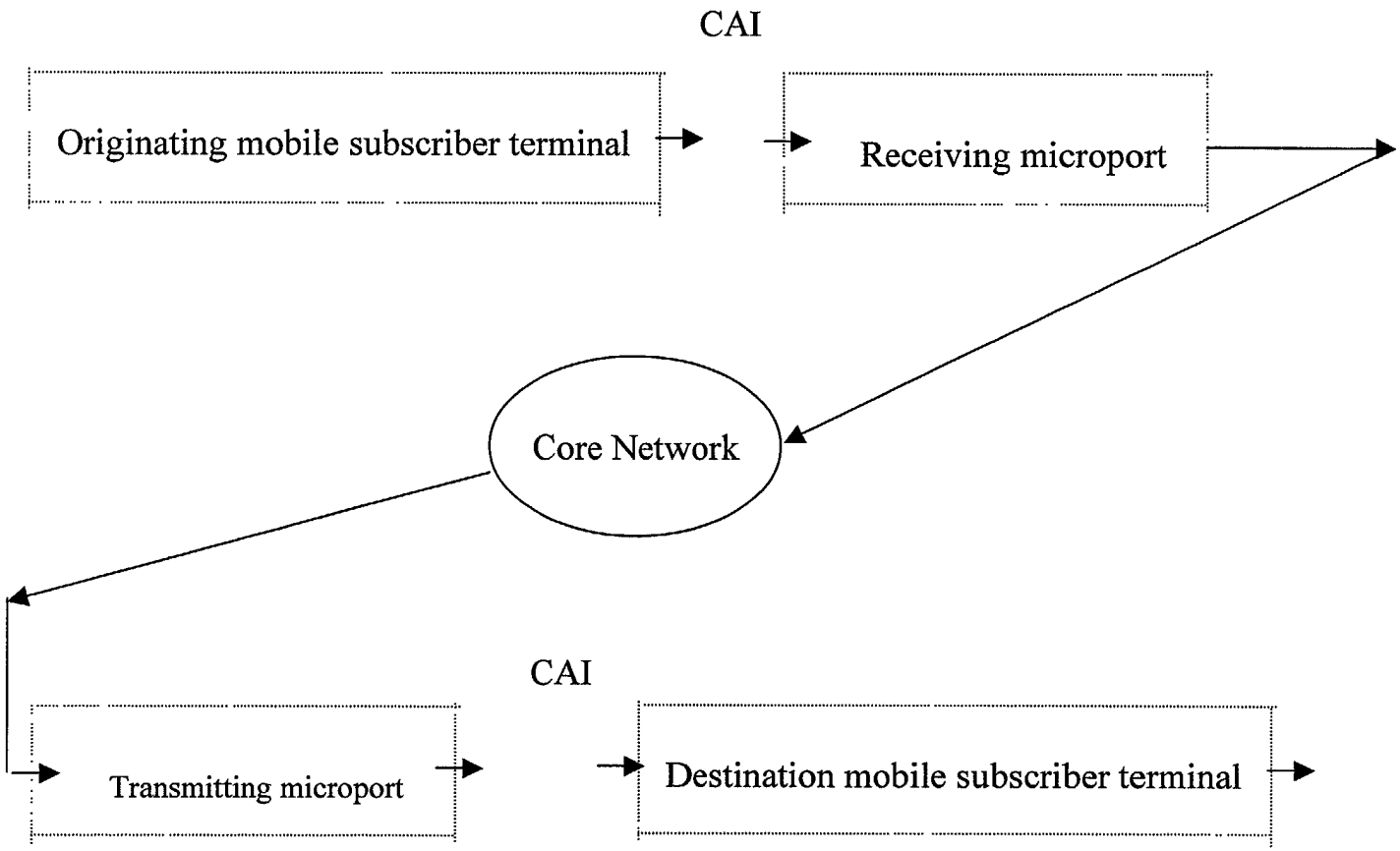
CAI
Originating mobile subscriber terminal
Receiving microport
Core Network
CAI
Transmitting microport
Destination mobile subscriber terminal

Fig. 6

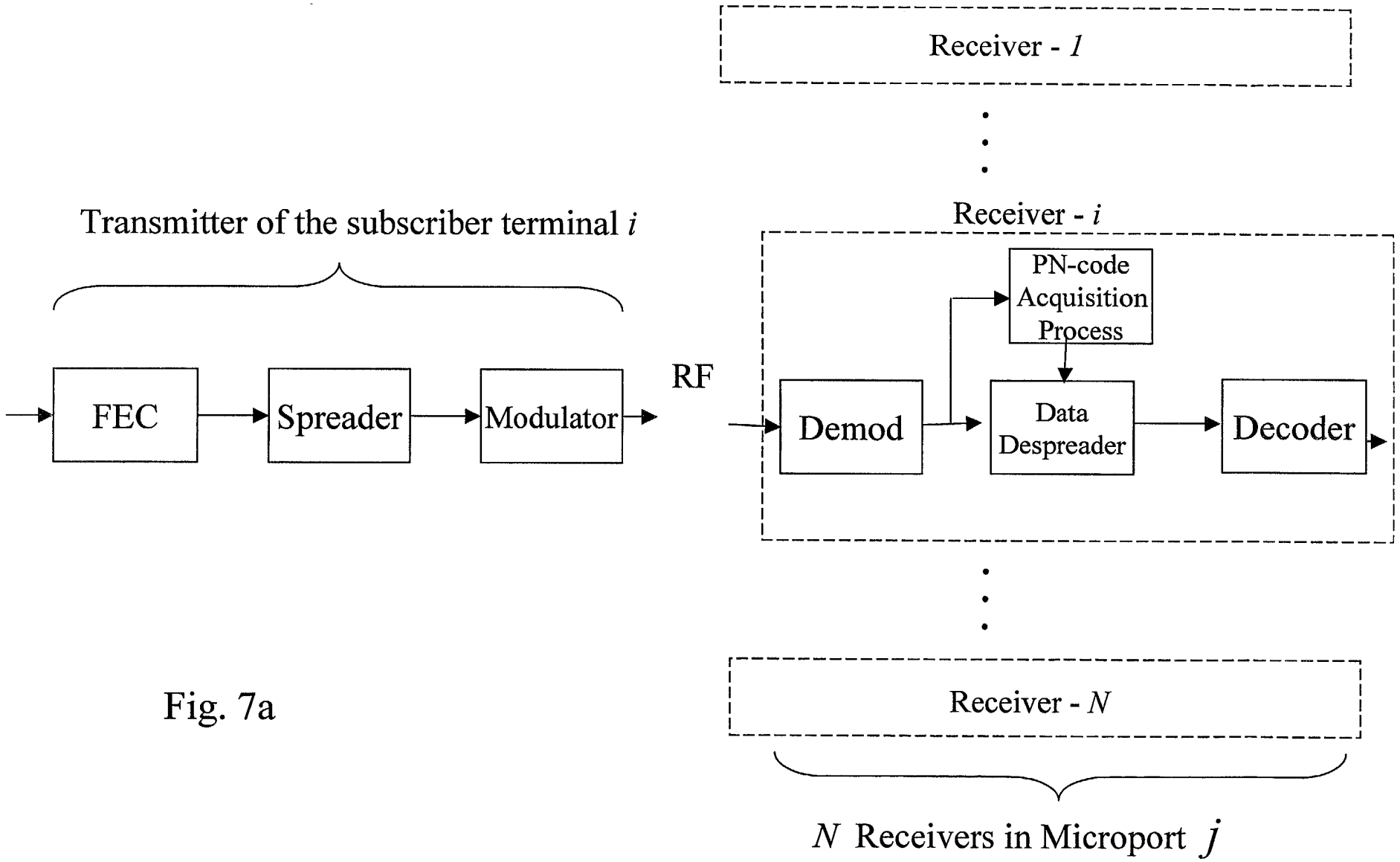
Receiver - 1
Receiver - i
Transmitter of the subscriber terminal i
PN-code Acquisition Process
FEC
Spreader
Modulator
RF
Demod
Data Despreader
Decoder
Receiver - N
N Receivers in Microport j

Fig. 7a

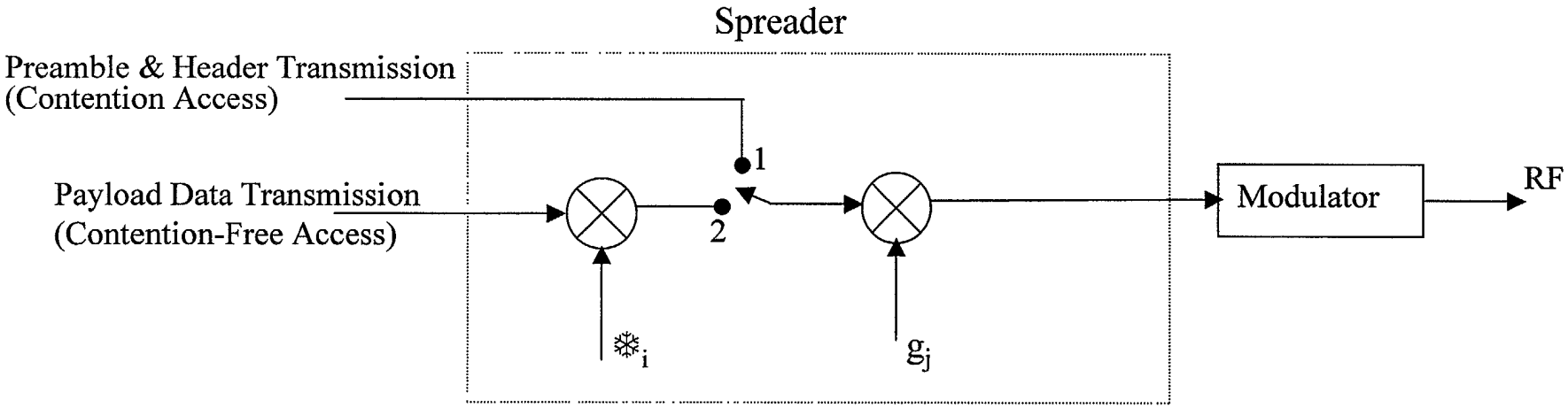
Spreader
Preamble & Header Transmission
(Contention Access)
Payload Data Transmission
(Contention-Free Access)
1
2
Modulator
RF
$\aleph_i$
g_j

Fig. 7b

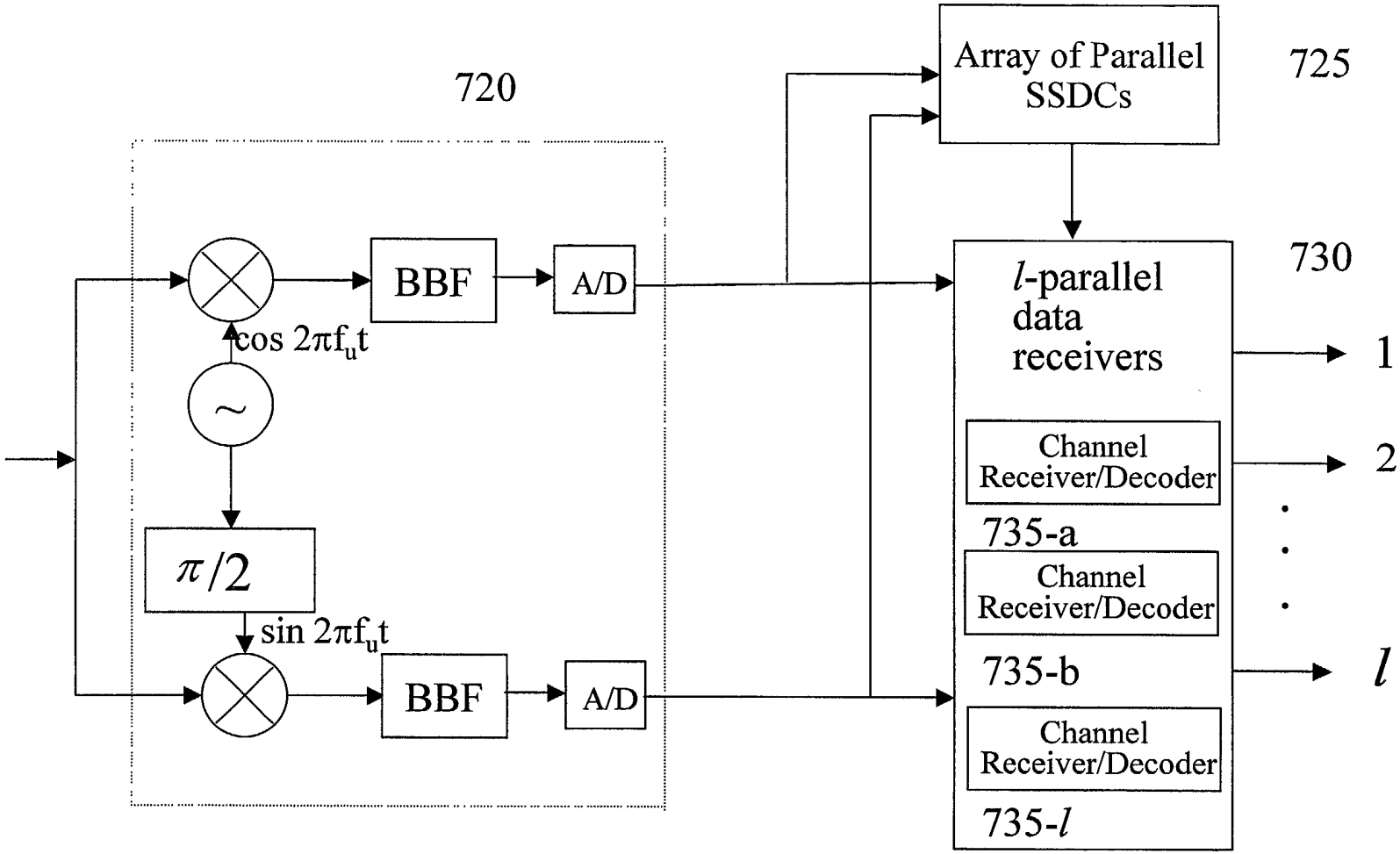
720
Array of Parallel SSDCs
725
730
BBF
A/D
cos 2πf_u t
~
π/2
sin 2πf_u t
BBF
A/D
l-parallel data receivers
Channel Receiver/Decoder
735-a
Channel Receiver/Decoder
735-b
Channel Receiver/Decoder
735-l
1
2
l

Fig. 7c

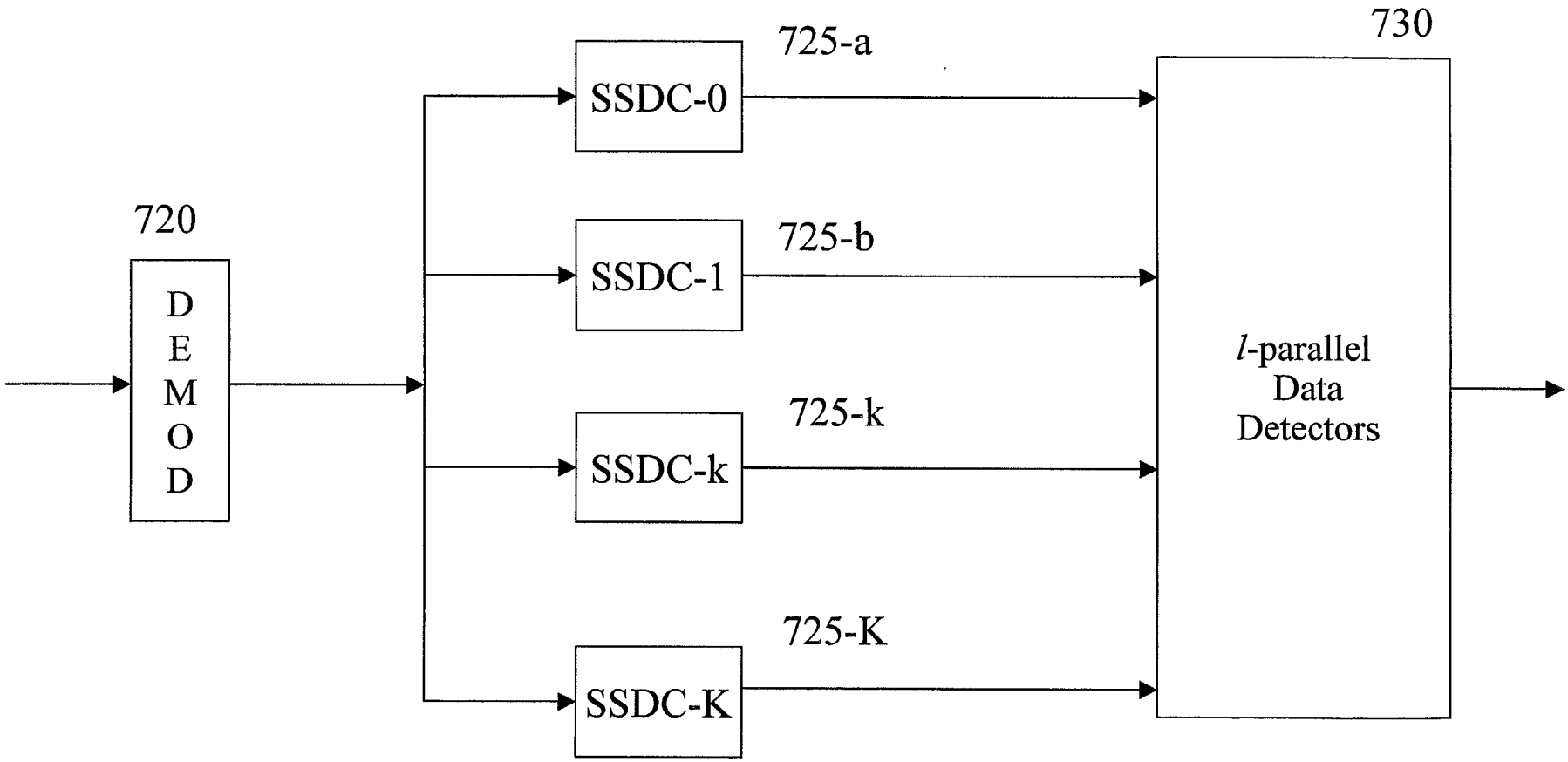
720
D
E
M
O
D
SSDC-0
725-a
SSDC-1
725-b
SSDC-k
725-k
SSDC-K
725-K
730
l-parallel
Data
Detectors

Fig. 7d

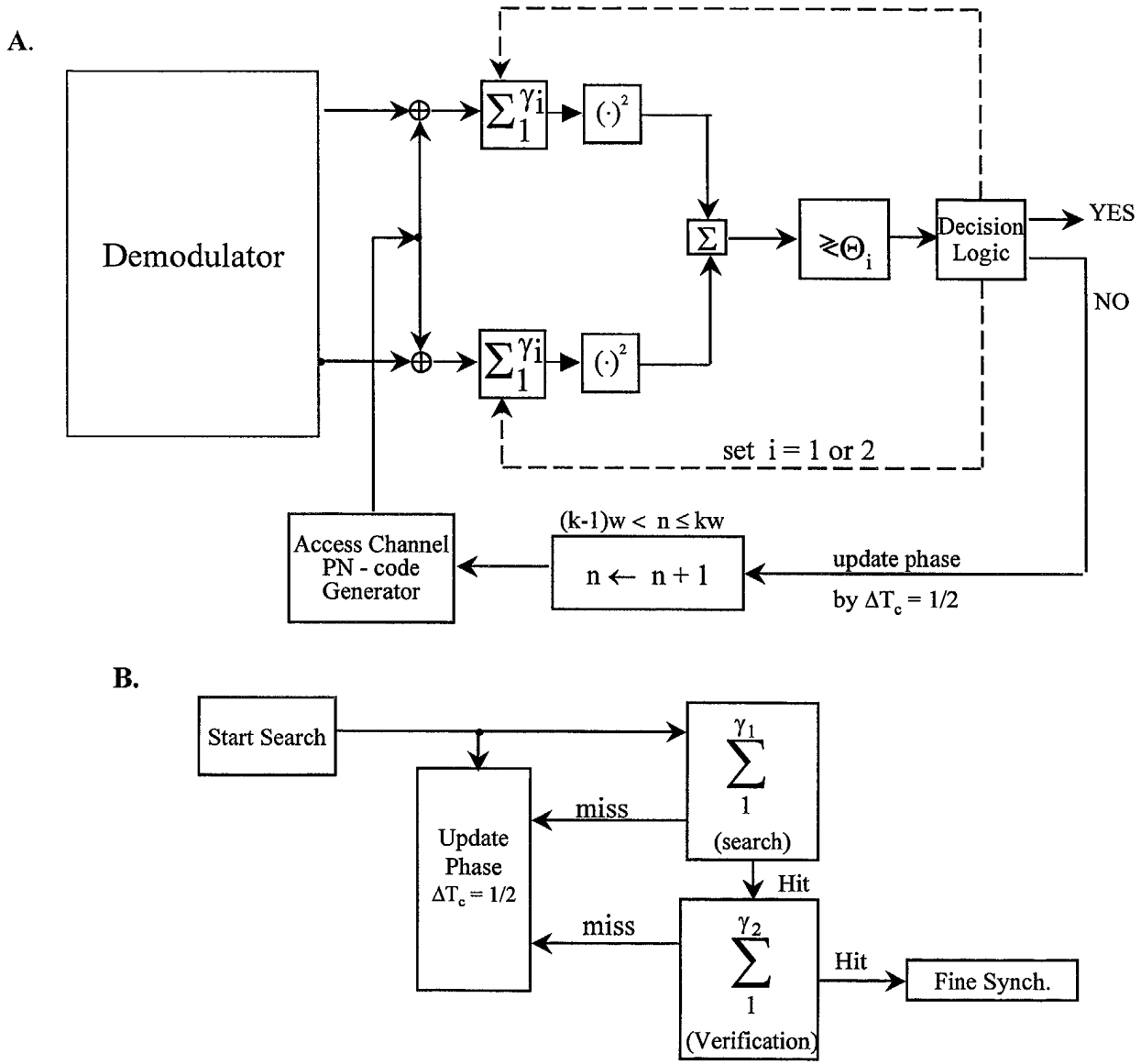
A.
Demodulator
$\sum_1^{\gamma_i}$
$(\cdot)^2$
$\sum_1^{\gamma_i}$
$(\cdot)^2$
$\sum$
$\gtrless\Theta_i$
Decision Logic
YES
NO
set i = 1 or 2
Access Channel PN - code Generator
(k-1)w < n ≤ kw
n ← n + 1
update phase
by $\Delta T_c = 1/2$
B.
Start Search
$\sum_1^{\gamma_1}$
(search)
miss
Update Phase
$\Delta T_c = 1/2$
Hit
miss
$\sum_1^{\gamma_2}$
(Verification)
Hit
Fine Synch.

Figure 7e

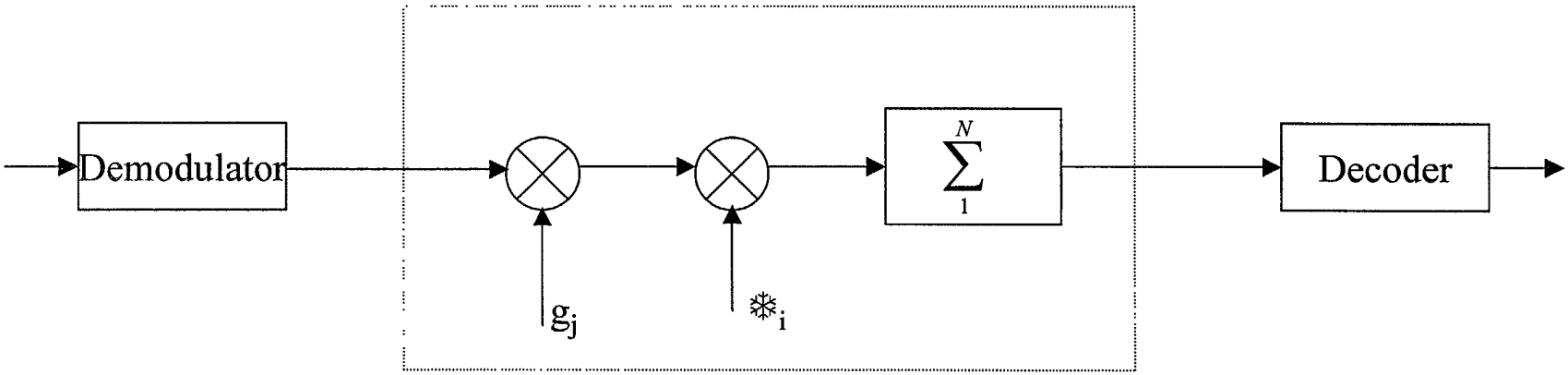

Fig. 7f

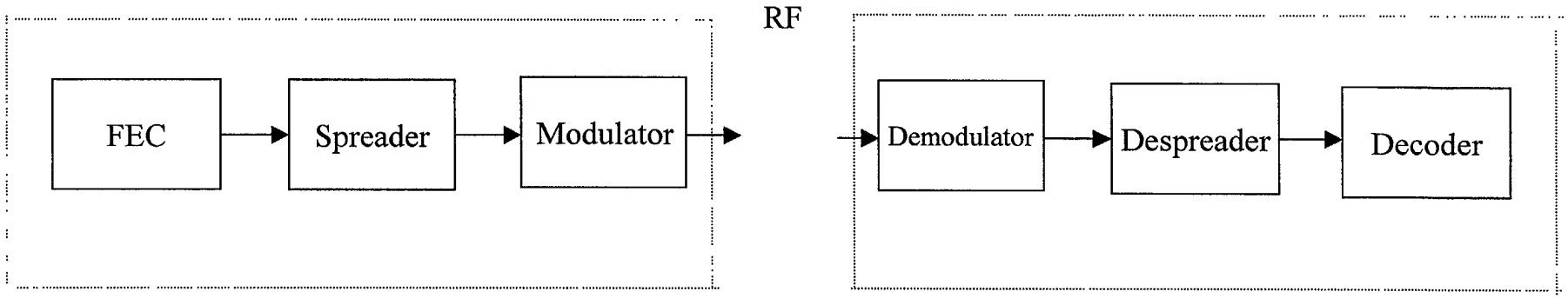
FEC
Spreader
Modulator
RF
Demodulator
Despreader
Decoder
Transmitting microport
Destination mobile subscriber (user) terminal

Fig. 8a

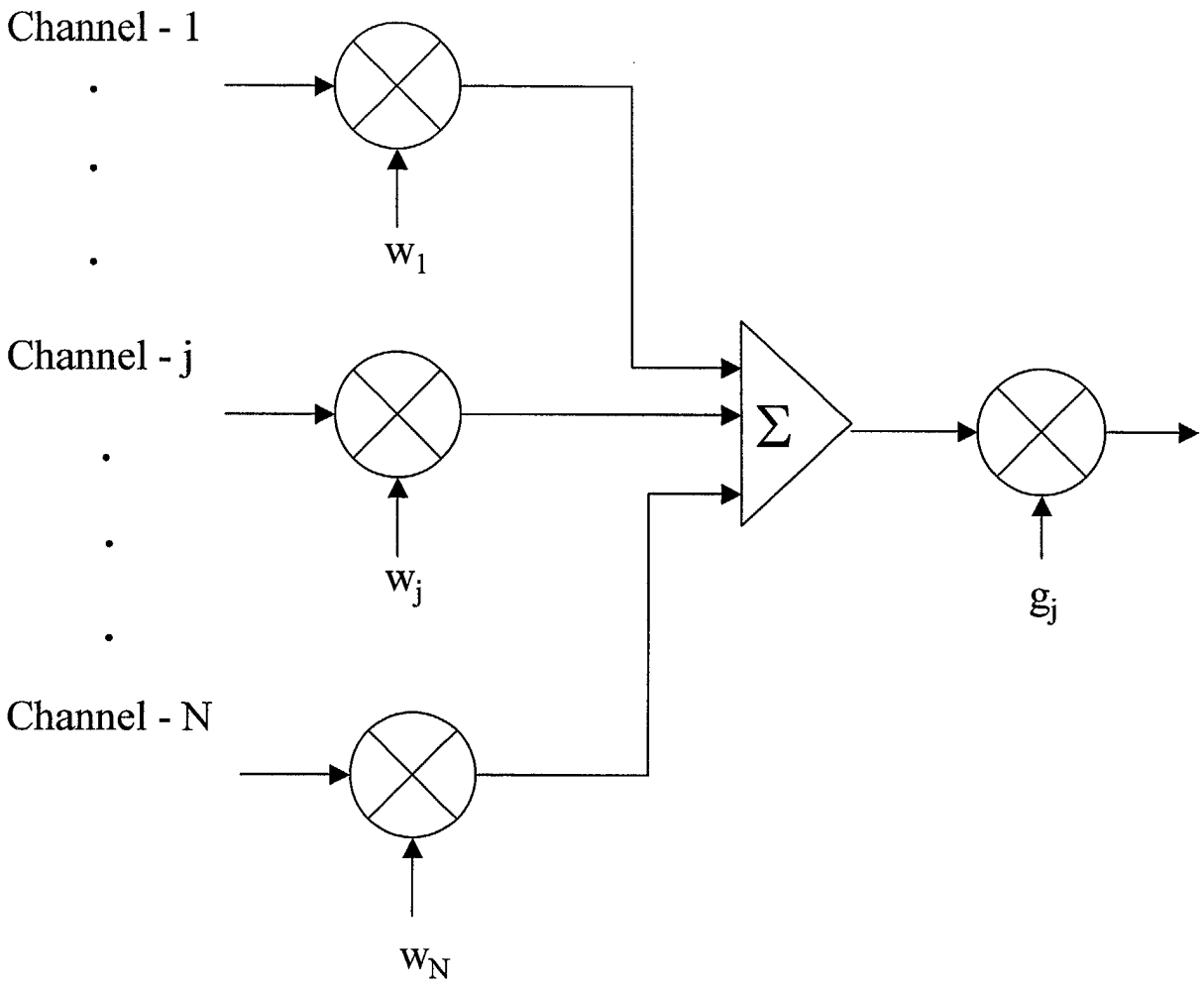

Fig. 8b

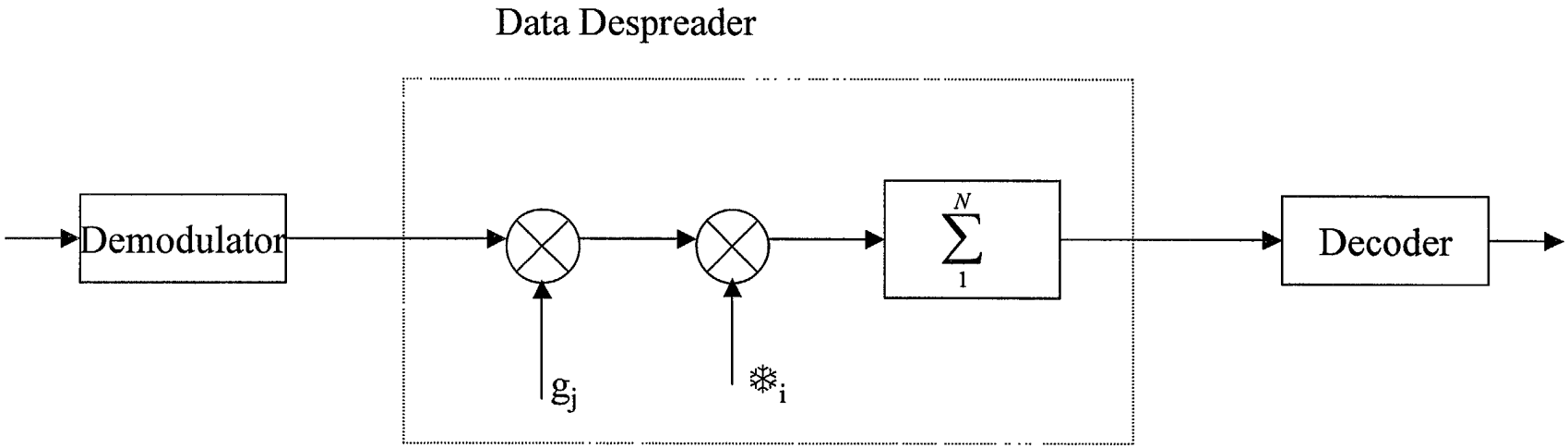

Fig. 8c